Research Paper | Engineering | E-ISSN No : 2454-9916 | Volume : 2 | Issue : 2 | Feb 2016

DETECTION OF DISEASES ON LEAVES AND ITS POSSIBLE DIAGNOSIS USING CBIR TECHNIQUE

Parash Mehta [1] | Lavanya Saoji [1] | Ankit Dodrajka [1] | Tushar Chug [1]

[1] Department of Computer Engineering, Smt. Kashibai Navale College of Engineering.

ABSTRACT

Image Retrieval has been an important achievement of technological advancement in today's Age. In the process of retrieval, the features viz. colour, texture, entropy, densities are brought in a consideration for classification of images. The range of scope varies among various applications and proves to be useful for agricultural sector. This paper proposes the detection of diseases on the leaves of plants depicting radical changes over the surface (e.g. cotton plant). The difference between a normal cotton plant's leaf and an infected one is visually forecasted based on size, texture, colour, and density. As previous Methodologies have shown lack of processing abilities to a large database, CBIR technique is proposed for handling of large operations. CBIR technique is provided out as a combination of content based retrieval, colour analysis and data-mining techniques. Thus, following information is used to segment leaf image into pixel format. The software analysis is further based upon the nature of image, producing respective results.

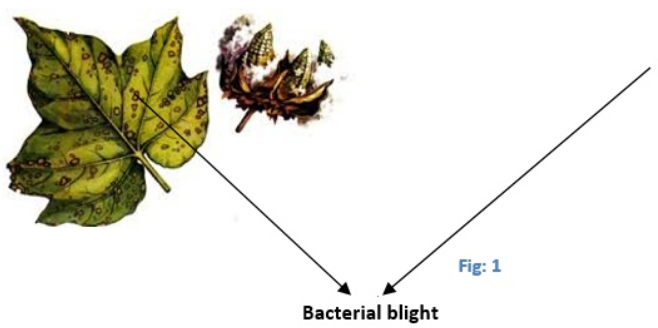
KEYWORDS: Image processing, farmer helping system, Smartphone, CBIR.

1. Introduction:

The cotton holds a large contributory factor in country's textile industries. The use of cotton varies from clothing, medical appliances, etc. The diseases that afflict cotton plants are as follows:

- Bacterial Blight
- Crown Gall
- Lint Degradation
- Anthracnose
- Leaf Spot
- Leaf Curl
- Leaf Crumple
- Leaf Roll

Besides, the purpose of the choice of cotton plant for the research is because of the way it shows symptoms of its diseases. The range of diseases visually seen on the leaves of the cotton plant varies between 80%-90%. This provides a basic component for the domain of image processing to segment, analyse, combine, store the image into pixel format(data). Image processing is a vast domain with functionalities, namely.



- Image conversion
- Image analysis
- Image retrieval

Various algorithms are in forms of module, and analysed in the application software to execute the functionalities. One of the important features of the domain in feature detection, which can provide study cases robustly. Image processing toolbox and Java processing APIs are used for dynamic allocation of diagnosis for the diseases of cotton plant.

The best solution will be use of CBIR technique.

CBIR (Content based image retrieval) technique is a form of content based approach mechanism. Among the approaches for data retrieval, text-query or text based approach has some shortcomings as each person can have different perception for each textual query. These shortcomings are duly nullified by content-based approach.

Fig: 2

2. Goals and Objectives:

So we would like to propose a model which will help farmers to:

- Understand different types of leaf disease
- To find a disease if he/she provide ONLY image of leaf
- To find solution of the disease

To achieve precise solutions, CBIR mechanism would be liable analyse the image format of diseases of cotton leaf.

3. Literature Survey:

Upon conducting a survey, it is found that there are various papers suggesting an array of ways to deal with the detection of diseases in cotton plants. The common factor, of course, being the integration of Computer in agriculture. When the question arises for use of computer in this field, a prime factor has to be dug out, which shall be used for the task to be carried out. Here, the factor is feature selection and the various methods and algorithms followed to carry out the same. Depending on how well this is dealt with, directly shows how well the system shall perform in

terms of speed, pattern recognition and matching accuracy. Boiling down to two approaches that are accepted as well as prevail among other contenders are – Fuzzy Curve(FC) and Fuzzy Surfaces(FS).

These are the two proposed solutions that can be used by the CBIR system to detect the diseases appearing over the leaf of cotton plant. To extract the best possible outcome, fuzzy selection approach is exploited. Initially, use FC to automate the quick isolation of a set of significant features from the set of original features according to the importance. Now, prune off the spurious ones. Further, use FS to remove features that are coherently dependent on the significant features found in previous step. This approach reduces complexity when feature extraction is undertaken and induces simplicity in the mechanism. Moreover, this seems a more viable option than random human selection or any other method for feature extraction and granulizing the complexity.

However, survey suggests another way for the detection of diseases being shown on leaves. For instance, consider grape plant, which exhibits a similar property of diseases being revealed by symptoms surfacing over plant leaf. This way suggests use of hybrid systems, which involves use of Artificial Intelligence(AI) and a well-trained system with self-evolving features. This system can show expertise in detection of diseases once well-trained. It reduces the necessity of admin-intervention at later stages, if not eliminate them. [Cotton leaf spot diseases using image processing edge detection techniques, IEEE 2013].

Segmentation algorithms are categorized into two classes, viz. searching similarities or searching discontinuities. The algorithms used for locating discontinuities in the data are edge-based, while the other, dealing with locating pixels being adjacent, based on similarities being region based. Majority of algorithms can be classified under either of the two classes. However, apart from these two major classes, there are a number of general sub-categories as well. Exemplifying the same, it can be said that algorithms either process colour or grayscale data, operating individually on pixel-basis or neighbourhood of local pixels. Cheng discussed major segmentation approaches for segmenting images that were monochrome. These approaches are : characteristic feature clustering, neural networks, fuzzy techniques, region-based methods, training method, edge detection, histogram threshold.

To conclude, the segmented image found as a result, is filtered by Gabor Wavelet which allows the system to analyze colour features of leaf afflicted with disease, more efficiently. The SVM or Support Vector Machines are apples to classify the type of diseases. This system can also be implemented for plants such as grapes which show a similar characteristic of exhibiting symptoms and presence of diseases on its leaves.

4. Ideas and Approaches:

4.1 Algorithms:

The algorithms perceptively denoted for this system are:

4.1.1 Color feature extraction:

HSV (Hue Saturation Value) color model uses a linear gauge to form a uniform color space. Euclidean distance is used to determine distance between colors, depicting proportionality between corresponding pixels. It is very suitable for color based image similarity comparison

4.1.2 Texture feature extraction based on GLCM

GLCM with the help of directions and distances between pixels, creates a legitimate matrix and then extracts meaningful statistics from the matrix as texture features. According the correlation of the couple pixels gray-level, GLCM expresses the texture feature at different positions. The feature is precisely described by quantification ally.

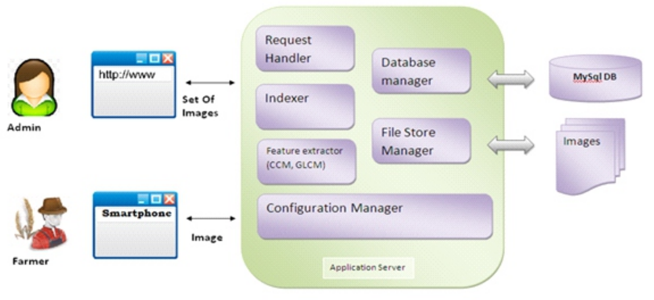


Fig: 3 CBIR 3-tier architecture overview

4.2 Proposed Solution:

The proposed solution is the 3-tier architecture, namely:

- Presentation layer
- Application layer
- Database layer

4.3 Equations:

4.3.1 Colour Feature Extractor:

Colour expectancy:

$$\mathrm{Ei} = 1/\mathrm{N}\sum_{j=1}^{N}\mathrm{Pij}$$

Colour variance:

$$\delta i = \left(1/N\sum_{j=1}^{N}(Pij - Eij)^2\right)$$

Colour skewness:

$$\sigma i = \left(\frac{1}{N}\sum_{j=1}^{N}(Pij - Eij\right)^3$$

4.3.2 Texture Feature Extractor:

Energy: Reflecting the distribution of image uniformity of weight and texture .

Energy $E=p(x,y)^2$

Contrast: Main diagonal near the moment of inertia

Contrast $I=\sum\sum(x-y)^2\,p(x,y)$

Entropy: Entropy measures image texture randomness

Entropy $S=\sum\sum p(x,y)\log p(x,y)$

The extraction of the features and image disease classification is in the following fig:

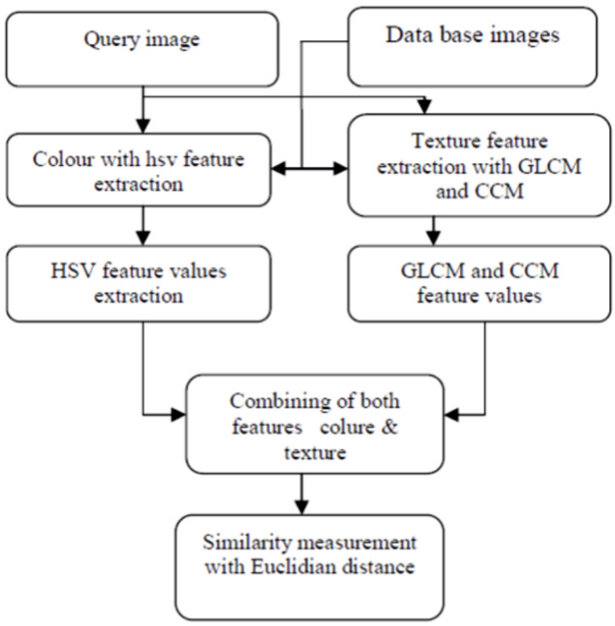


Fig: 5

In the figure above, a systematic and brief overview has been presented. The mechanism of image retrieval is as follows:

- Algorithms provided, the values of Query image and database image are extracted and stored in a database.

- Query image values are combined with database image and similarity measurement is calculated by Euclidian distance.

$$D = \sqrt{(x+y)^2(x-y)^2}$$

- The threshold value considered, precise output images along with respective results are provided.

Advantages:

- Faster output than pervious image
  Retrieval and analysing methodologies.

5. Conclusion:

CBIR is indeed a field that is rapidly advancing and keeping up the pace with other fields of technology including artificial intelligence and hybrid system. Different methodologies are implemented; varying from use of Euclidean Distance, use of Hamming Distance an image transformation, making use of histogram.

Further prospect lies in improving the retrieval efficiency, speed and accuracy of the result provided. Moreover, the view-point of making it "self-evolving" would improve its credibility and chances of surviving in the ever-pacing up race of technological advancement.

6. Acknowledgements:

We would like to take this opportunity to thank my internal guide Prof. S.V. Dabhade for giving us all the help and guidance we needed. We are really grateful to them for their kind support. Their valuable suggestions were very helpful. We are also grateful to Dr.P.N.Mahale, Head of Computer Engineering Department and Smt. Kashibai Navale College of Engineering for its indispensable support.

7. REFERENCES:

1. RitendraDatta, Dhiraj Joshi, Jia Li and James Wang, "Image Retrieval: Ideas, Influences, and Trends of the New Age", Proceedings of the 7th ACM SIGMM international workshop on Multimedia information retrieval, November 10-11, 2005, Hilton, Singapore.
2. C. Carson, S. Belongie, H. Greenspan, and J. Malik, "Blobworld: Image Segmentation Using Expectation-Maximization and Its Application to Image Querying," in *IEEE Trans. On PAMI*, vol. 24, No.8, pp. 1026-1038, 2002.
3. Y. Chen and J. Z. Wang, "A Region-Based Fuzzy Feature Matching Approach to Content-Based Image Retrieval," in *IEEE Trans. on PAMI*, vol. 24, No.9, pp. 1252-1267, 2002.
4. Natsev, R. Rastogi, and K. Shim, "WALRUS: A Similarity Retrieval Algorithm for Image Databases," in *Proc. ACM SIGMOD Int. Conf. Management of Data*, pp. 395–406, 1999.
5. J. Li, J.Z. Wang, and G. Wiederhold, "IRM: Integrated Region Matching for Image Retrieval," in *Proc. of the 8th ACM Int. Conf. on Multimedia*, pp. 147-156, Oct. 2000.
6. V. Mezaris, I. Kompatsiaris, and M. G. Strintzis, "Region-based Image Retrieval Using an Object Ontology and Relevance Feedback," in *Eurasip Journal on Applied Signal Processing*, vol. 2004, No. 6, pp. 886-901, 2004.
7. W.Y. Ma and B.S. Manjunath, "NETRA: A Toolbox for Navigating Large Image Databases," in Proc. IEEE Int. Conf. on Image Processing, vol. I, Santa Barbara, CA, pp. 568–571, Oct. 1997.
8. W. Niblack*et al.*, "The QBIC Project: Querying Images by Content Using Color, Texture, and Shape," in *Proc. SPIE*, vol. 1908, San Jose, CA, pp. 173–187, Feb. 1993.
9. Pentland, R. Picard, and S. Sclaroff, "Photobook: Content-based Manipulation of ImageDatabases," in *Proc. SPIE Storage and Retrieval for Image and Video Databases II*, SanJose, CA, pp. 34–47, Feb. 1994.
10. M. Stricker, and M. Orengo, "Similarity of Color Images," in Proc. SPIE Storage and Retrieval for Image and Video Databases, pp. 381-392, Feb. 1995.
11. DOI:10.2298/CSIS120122047C /A Novel Content Based Image Retrieval System using K-means/KNN with Feature Extraction Ray-I Chang 1, Shu-Yu Lin 1,2, Jan-Ming Ho 2, Chi-Wen Fann 2, and Yu-Chun Wang 2.